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Frederick R. Vobbe
706 Mackenzie Drive
Lima OH 45805-1835
Fred@vobbe.com 419-228-6223

February 10, 2003

Marlene H. Dortch, Secretary
Federal Communications Commission
Office of the Secretary
445 12th Street, SW
Washington DC 20554

Re: MM Docket 99-325
Digital Audio Broadcasting Systems and Their Impact on Terrestrial Broadcasting
Sub: Reply Comments

Dear Ms. Dortch:

On behalf of myself, I am enclosing my comments in reference to the above referenced proceeding.

Kindly communicate any questions directly to me by E-mail, phone, or mail.

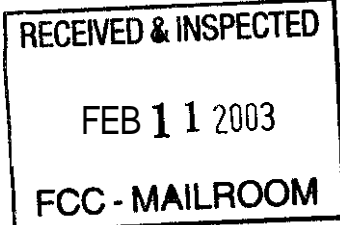
Respectfully submitted,

Frederick R. Vobbe

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington D.C. 20554



In the Matter of)
Amendment of Part 73 of the)
Commission's Rules to Permit)
The Introduction of Digital Audio)
Broadcasting in the AM)
And FM Broadcast Service)

Docket Number: **MM 99-325**

Frederick R. Vobbe
706 Mackenzie Drive
Lima OH **45805-1835**
E-mail: fred@vobbe.com

I am a qualified engineer with service in the broadcast industry starting in April **1968**. I am a licensed and practicing amateur radio operator, radio/electronics experimenter, and longtime radio listener. My professional duties include VP/Chief Operator of an NTSC and DTV television station, Communications Officer for a county E.M.A., and co-chairman of the local E.A.S. district. I also publish a monthly magazine on tape for blind radio enthusiasts, and jointly operate a web site and various E-mail lists on the topic of radio/TV technology and listener support.

I urge the Commission to revoke its authorization of terrestrial digital In Band On Channel (IBOC) digital audio broadcasting as proposed by iBiquity Digital Corporation in the AM radio band.

This dismissal request is requested due to the known interference issues to analog services. Unlike the digital television conversion, and the black & white to color system conversion, the commission has failed to adequately protect and prohibit interference. This has posed serious harm to the licensee of analog broadcast stations, and has affected the public.

Interference

I have spoken with engineers at stations operating the iBiquity IBOC system. They state that transmissions meet the NRSC mask of emissions set forth in the FCC rules. The NRSC mask was designed for analog transmissions. The NRSC mask is perfectly acceptable for analog program content. However, digital transmissions fill the entire mask area between **2.5** and **5** kilohertz. This digital modulation is an almost constant carrier of 100%-modulated noise to an

analog receiver. The NRSC mask is an invalid measurement standard for transmissions of constant amplitude.

Most AM receivers do not have the sophisticated band pass capabilities to reject signals in excess of 5 kilohertz. This means that while an AM station may transmit IBOC, and adhere to the NRSC mask standard, the common receiver often extends 7 kilohertz or more off carrier for detection of analog information.

For example, in a stock GE "Superradio III" portable radio, the receiver normally captures transmitted signals 5 to 8 kilohertz either side of carrier. Under analog conditions this is acceptable, as any analog information from adjacent channels is random and not necessarily constant in nature.

However, if a station is transmitting IBOC on 710 kilohertz, and the GE Superradio III is tuned to 700 kilohertz, the result will be that the radio hears both the station at 700 kilohertz, and the digital noise from the station at 710 kilohertz. This digital signal is demodulated in the form of a background hiss that lowers the signal to noise ratio of the station on 700 kilohertz.

While those of us who are engineers can understand this concept, and know what is happening, the average public hears this noise and blames the station they are listening to, rather than the offending adjacent channel interference.

In addition to 700 kilohertz being affected, a station on 720-kilohertz is also affected when a station on 710 kilohertz is transmitting IBOC. Since the transmissions of digital information are on both sides of the 710-kilohertz carrier.

After the Commission understands this relationship of noise to an analog service from an adjacent channel IBOC service, one needs only speculate what a portion of the AM band might sound like if several stations were transmitting IBOC. For example, WSB-750 in Atlanta GA, WJR-760 in Detroit MI, WABC-770 in New York ~~NY~~, and WBBM-780 in Chicago. All of these 50,000-watt stations can co-exist in analog without harm to each other. If all of them were to run IBOC, they would likely be unusable in their secondary service areas. Additionally, 750 would cause interference to 740, and 780 would cause interference to 790.

It was also noted during WLW and WOR tests that the "hissing" noise of IBOC was heard well over a 1,000 miles away, and affected the reception of other stations. These included broadcast facilities on 690, and 720 kilohertz. The digital noise from WLW's IBOC tests was heard as far away as Arizona, although it was hard to hear the analog broadcast!

Several parties commented that in some cases interference would be "acceptable". I would suggest to the Commission that interference is not acceptable under any circumstances.

Fidelity

I have listened to receiver tests of the iBiquity AM IBOC system. I feel that the quality of the transmissions is slightly better than a low bit rate MP3. In specific, the "swish" of the coding was more objectionable than any analog artifacts, including noise.

In IBOC tests performed in New York, it was noted that the maximum usable range of reception was within the city grade signal level. Although the analog signal of a 50,000-watt, non-directional station may travel in excess of 200 miles, the digital portion starts to lose usable signal from 40 to 50 miles out. In that area of 50 to 200 miles I noted that the IBOC component mixed with the analog component and produced a "fuzzy" sounding analog signal. This makes reception in distant areas unusable, in effect reducing the coverage of a station.

Many broadcasters believe that they need to have the fidelity of a FM station, or CD quality in order to attract an audience. I respectfully submit that IBOC is a technology issue that does not address a content issue that ultimately attracts listeners, (and revenue).

It should be noted that there are other technologies other than IBOC to improve fidelity issues. One is the Kahn Communications Independent Sideband Stereo system. Another is the Motorola C-Quam system. In the case of the Kahn system, (as monitored on several broadcast stations), the quality of the audio response and stereo separation was most acceptable, and under normal circumstances compared to FM. This included fringe areas, long distance, and complex multi-tower directional antenna systems. Transmission of analog signals in high fidelity is possible!

I firmly believe that the reason AM radio sounds bad to the consumer is due to technical issues of receiver manufacturing. Why is it that receivers manufactured prior to 1970 sound better than receivers today? The fidelity issue can only be resolved when the Commission imposes strict technology standards on all radios manufactured and sold in the U.S. There is no reason that an analog AM radio sold in the United States can not have a flat audio response, (± 2 dB) from 35 hertz to 9 kilohertz, and maintain a THD of less than 5% under normal reception conditions. There is also no reason that automobile manufacturers can not provide in-dash ~~car~~ radios where the AM reception is every bit as good as the FM reception. AM does not have to be compromised.

Although fidelity is important, it is not what drives people to a radio station. It's the content. This is proven by the number of teens listening to web broadcasts, Real Audio™, and MP3s. They are looking for content that is not found on radio, even high quality/CD quality FM radio.

To conclude this section, IBOC does not improve audio quality, and simply improves signal to noise. It is my understanding that signal to noise is not an issue to a broadcaster.

Impact to the Public

The Commission, by allowing IBOC transmissions to continue, is putting the American people into a position of being forced to buy new radios or put up with unacceptable interference that has not been present since the dawn of broadcasting.

I am also sure that the Commission does not want to force the public into purchases of radio equipment, especially in an economic climate that is uncertain. Pushing the public in this direction could lead some families to choosing between no radio or having to give up other necessities.

Radio has long been a source of news, information, and emergency information for the American public. Many blind and physically handicapped people use radio as their first and only choice of information. Analog radio is the preferred entertainment media, and news source for people commuting to work each day.

The Commission should be aware that by allowing IBOC to continue on the ~~AM~~ band they are;

- a) Disabling the ability of the public to listen to analog radio.
- b) Placing unnecessary financial burden on citizens that is not needed, or requested.
- c) Putting the American public in jeopardy through loss of program content.
- d) Placing the public in jeopardy by causing interference to stations that they would listen to in times of national, state, or local emergency.

Impact to the Broadcaster

Stations who have their analog service areas compromised by IBOC interference will suffer financially. A loss of service area will lead to losses in income, as well as loss of credibility

Some stations will be injured forever. Some may have to get involved with lengthy court battles. Others may just have to accept their fate and live with the losses.

There is no way to look at all the AM radio stations and project which ones would be impacted. We know that content drives listeners to a particular station, and makes it profitable. We know that interference will limit the ability of the listener to use the product. We know that once damaged, it will be next to impossible to regain all the losses.

The Commission does not want to be a party to those losses. The Commission should insure that in its quest to deliver a digital platform, it does not allow harm to any broadcasters, technically or financially. The Commission needs to realize what the loss to some communities might be.

Real Life Experiences

During the month of August, I had the opportunity to travel toward Chicago, **IL**. While in Plymouth, **IN**, in the late afternoon, I attempted to listen to **WGN**¹ to get information on driving conditions and the weather. **WGN**'s transmissions were rendered useless due to interference from **WOR**².

At the time, **WOR** and **WLW**³ were testing the iBiquity IBOC system. (These tests were also conducted during the night). The result was that when **WOR** transmitted IBOC, the transmissions from **WGN** were compromised, and the end result was a bothersome "hiss" that made listening to a spoken voice on **WGN** difficult on my in-dash car radio.

It was also noted on this trip, and during the nighttime tests, that transmission of IBOC interfered with both adjacent channels. That is, when **WLW** was transmitting IBOC, **WOR** and signals on 690 were rendered useless, and when **WOR** was transmitting IBOC, **WLW** and **WGN** were rendered useless. I would be very concerned for the public good should **WLW**, **WOR**, and **WGN** all utilize IBOC at the same time.

On December 24, 2002, I had traveled to Lambertville, **MI**, to be with family over the Christmas holiday. As long as I can remember, radio station **WOWO**⁴ has provided very detailed and accurate weather reporting for northwest Ohio and northeast Indiana.

On the morning of December 25th southeastern Michigan and northwest Ohio received substantial snowfall. I tried listening to **WOWO** to find out what the weather was like back in northwest Ohio. I was unable to receive **WOWO** due to interference from **WCHB**⁵. Despite using two uniquely different radios⁶ I was unable to clearly receive **WOWO**.

I would like to point out to the Commission that this had not been the case prior to starting digital transmissions by **WCHB**. Subsequent conversations with engineers at both stations indicate that both stations were operating within licensed parameters, and they were unaware of any technical issues that would cause a change. Therefore, this is not an exception, but more of what we can expect from IBOC transmissions. A loss of service is not acceptable.

A copy of some of the recordings I made for a news story on the National Radio Club's, DX Audio Service can be found at http://www.nrcdxas.org/audio/IBOC_Story.mp3. At 4:40 into the story you get the best representation of how bad IBOC trashes stations on adjacent channels.

¹ **WGN** Chicago **IL**. Operating on 720 kilohertz with 50,000 watts day/night.

² **WOR** New York **NY**. Operating on 710 kilohertz with 50,000 watts day/night.

³ **WLW Cincinnati** **OH**. Operating on 700 kilohertz with 50,000 watts day/night.

⁴ **WOWO** Ft Wayne **IN**. Operating on 1190 kilohertz with 50,000 watts day.

⁵ **WCHB** Taylor **MI**. Operating on 1200 kilohertz with 50,000 watts day.

⁶ **GE SuperRadio III**, and in-dash radio in a 2001 **Brick** Century.

Conclusions

- 1) I urge the Commission to move to prohibiting any further use of IBOC, and revoke its authorization of terrestrial digital In Band On Channel.
- 2) I request that the Commission institute a backward compatibility benchmark in regards to legacy, or heritage receivers. Any new transmissions system must not, under any circumstances, render adverse effects to analog receivers owned by the public
- 3) The Commission needs to consider the impact on other North American stations outside U.S. borders.
- 4) It should also be noted that interference from IBOC does not stop at borders, therefore any U.S. transmissions could impact citizens of other countries.⁷
- 5) Since the Commission is aware of actual, and potential interference problems cause by IBOC in the AM band, the Commission should relocate digital transmissions out of the 540 - 1700 kilohertz frequencies.
 - a) A separate band of digital frequencies should be **used**. Since most of the proponents of IBOC seek only HD radio within their immediate Grade-A or City Grade service, frequencies in the high VHF or UHF spectrum could be used.
 - b) For regional stations, or large service area stations, frequencies in the long wave or short wave spectrum could be utilized.
 - c) Transmissions of HD digital radio could co-exist within the television spectrum once all NTSC stations have transitioned to digital (DTV), and utilize portions of spectrum from vacant NTSC stations.
- 6) Testing of any future digital transmission should also include side by side tests of DRM by a neutral, third party. The Commission does not want the perception of ignoring all options in a race to go "digital", nor should the Commission show preference towards any one party.


Frederick R. Vobbe

⁷ This has been the case already as IBOC tests on WOR impacted reception in Canada, Finland, and Sweden, as noted in radio listener E-mail lists.